

SEMI-ANNUAL PROGRESS REPORT

Effect of Chronic Restraint on Absorption from the
Gastrointestinal Tract

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Submitted By:

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FACILITY FORM 602

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At the present time one group of rats is in the thirteenth week of restraint in hanging wire cages in which the living space has been reduced to ca. 2.6 cc per cc of body volume by use of wire spacers. A control group has been housed under similar conditions, except that they are allowed full access to the space of a standard hanging rat cage (7 x 7 x 10 inches).

Two additional groups of ten animals each are in the sixth week of restraint.

Hematological Values

Leucocyte counts of blood from restrained animals ranged from 6,270 to 12,650 with an average value of 9,800; counts in control (non-restrained) rats ranged from 9,130 to 12,400 with an average value of 10,970.

The hematocrit packed-cell-volume (by microhematocrit-capillary tube methods) ranged from 49 to 60% for restrained animals with an average of 52.6%. Unrestrained animals have had PCV values ranging from 49 to 56% with an average of 52.4%.

Effects of Restraint on Body Weight

The effects of restraint on body weight are presented in Graphs A and B. Animals restrained for thirteen weeks have an average body weight gain of 6.7%; over the same period the unrestrained control group has averaged a gain of 16.3%.

Glucose Absorption in Restrained and Non-Restrained Rats

The absorption of glucose in restrained and non-restrained rats is currently being investigated by administration of glucose as a test meal of 500 mg glucose in 1 ml aqueous solution. The administration is followed by serial blood sampling and determination of plasma glucose levels by the enzymatic glucose oxidase method (Glucostat, Worthington Biochemical).

Absorption curves constructed from data thus obtained are presented for weeks 1-5 for both restrained and non-restrained animals. (See following graphs.)

The effect on blood sugar levels of manipulation of the rat during administration of the test meal and subsequent blood sampling was ascertained by giving a test meal of distilled water in place of glucose solution and assaying the plasma glucose as described above.

Glucose absorption is also being determined by analysis of the quantities remaining in the gastrointestinal tract following administration of the glucose test meal. This has been determined by the glucose oxidase method and by use of glucose labeled with C-14. In this series of experiments the animals are sacrificed at weekly intervals; groups for which the glucose absorption curves are constructed are to be maintained for a period of 25 weeks in restrained or control environments.

Glucose Absorption Summary

Glucose absorption curves in the unrestrained animals for the first five weeks, shows a definite increase in blood glucose toward the end of the sampling period (45 minutes after administration) in all weeks except week-1 as compared to the restrained animals. This increased blood glucose level seems to be occurring earlier (and possibly becoming greater) with each succeeding week of the experiment.

A preliminary experiment using glucose-C-14 indicates that glucose is not released from the stomach in the restrained animals as rapidly as in the control (non-restrained) animals.

Enzymatic determination of the contents of the stomach and intestine of animals killed at the end of the 45 minute test period of animals restrained for thirteen weeks are as follows:

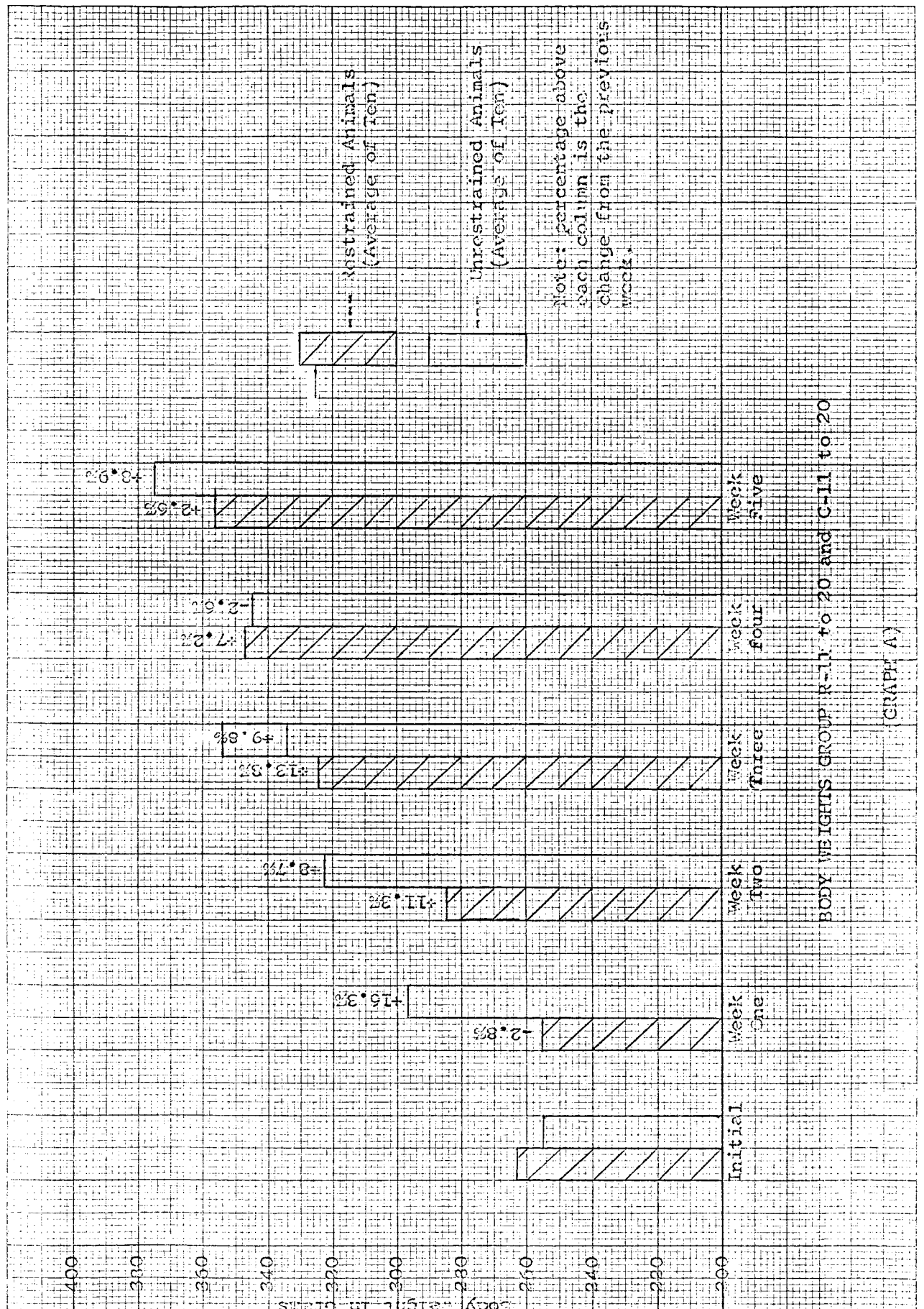
| | Stomach | Intestine first half | Intestine second half |
|------------------------------------|----------|-------------------------|--------------------------|
| Unrestrained (average of three) | 30.5 mg. | 5.7 mg. | 0.5 mg. |
| Restrained (average of three) | 37.6 mg. | 9.8 mg. | 0.4 mg. |

Amino Acid Absorption in Restrained and Non-Restrained Rats

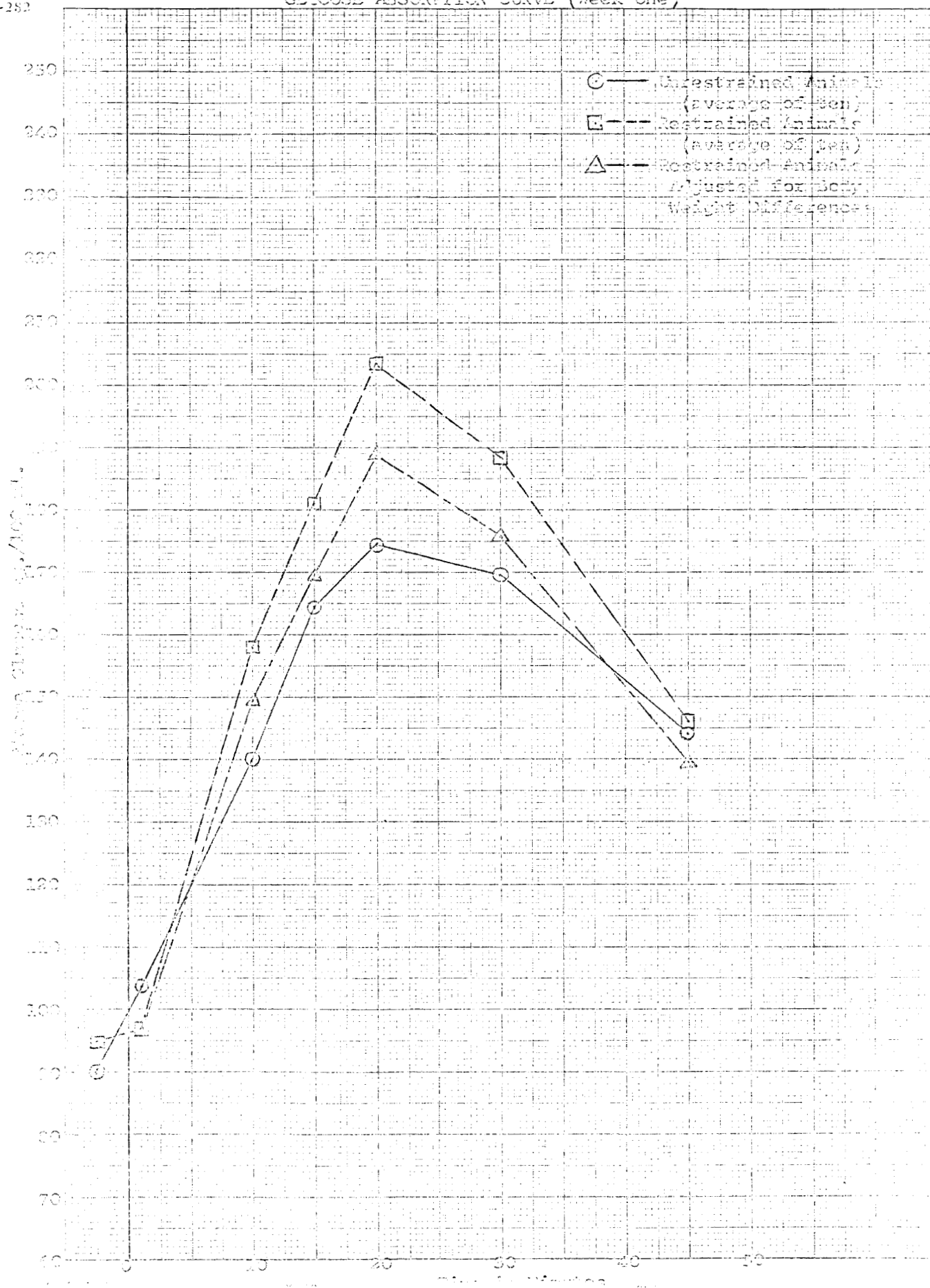
Absorption of amino acids by restrained and non-restrained rats is in the initial stages of study. Data from these experiments are incomplete and will not be presented here.

The methods currently being developed to study amino acid absorption involve electrophoretic separation of amino acids from deproteinized blood plasma and quantitation by use of a densitometric strip scanner. The support medium used in all electrophoretic separations is cellulose acetate.

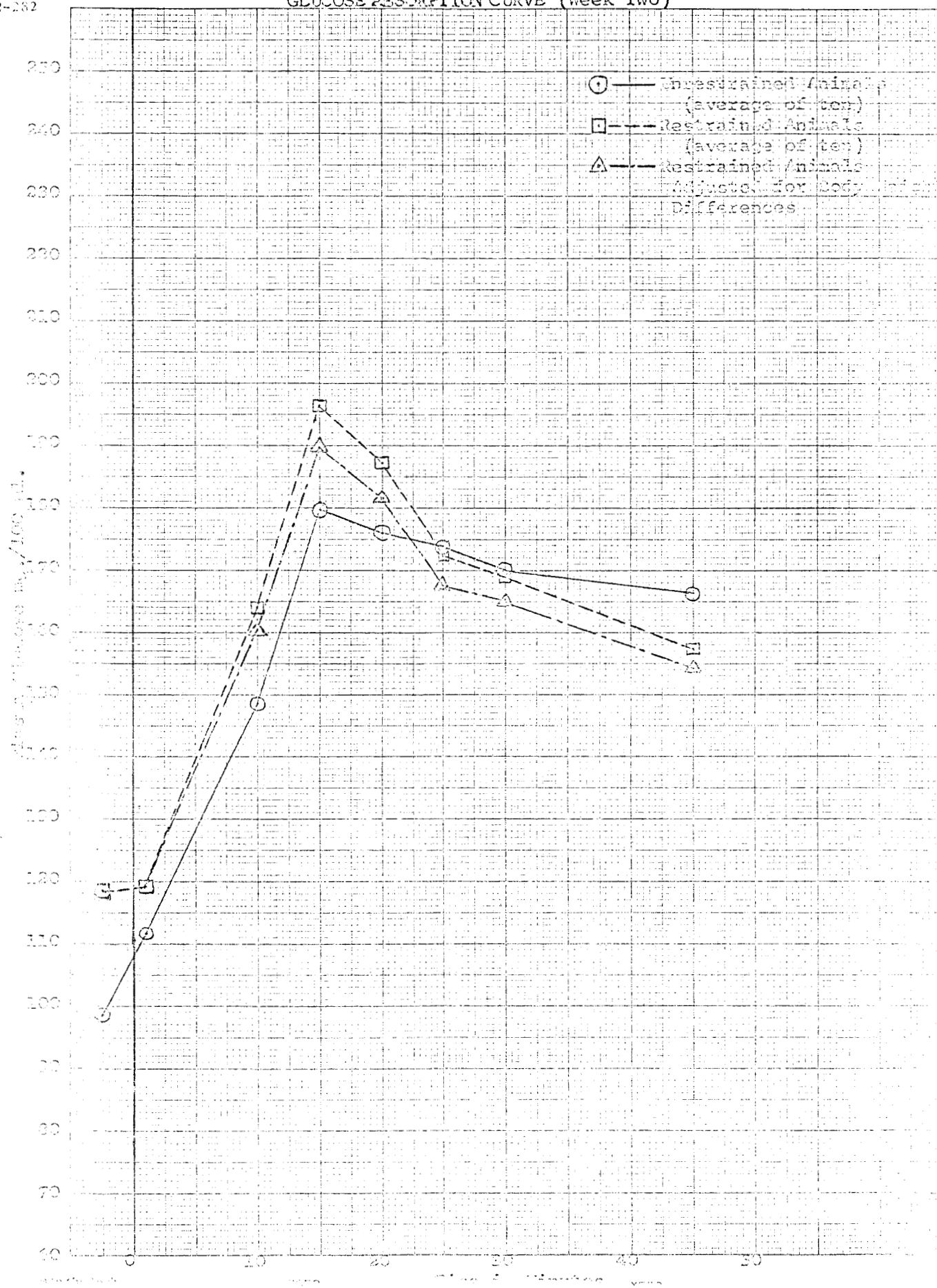
Amino acids labeled with C-14 are also being administered to test animals of both restrained and control groups; plasma and intestinal washings are then assayed for C-14 to determine the degree of absorption of the labeled amino acid.



GLUCOSE ABSORPTION CURVE (Week One)

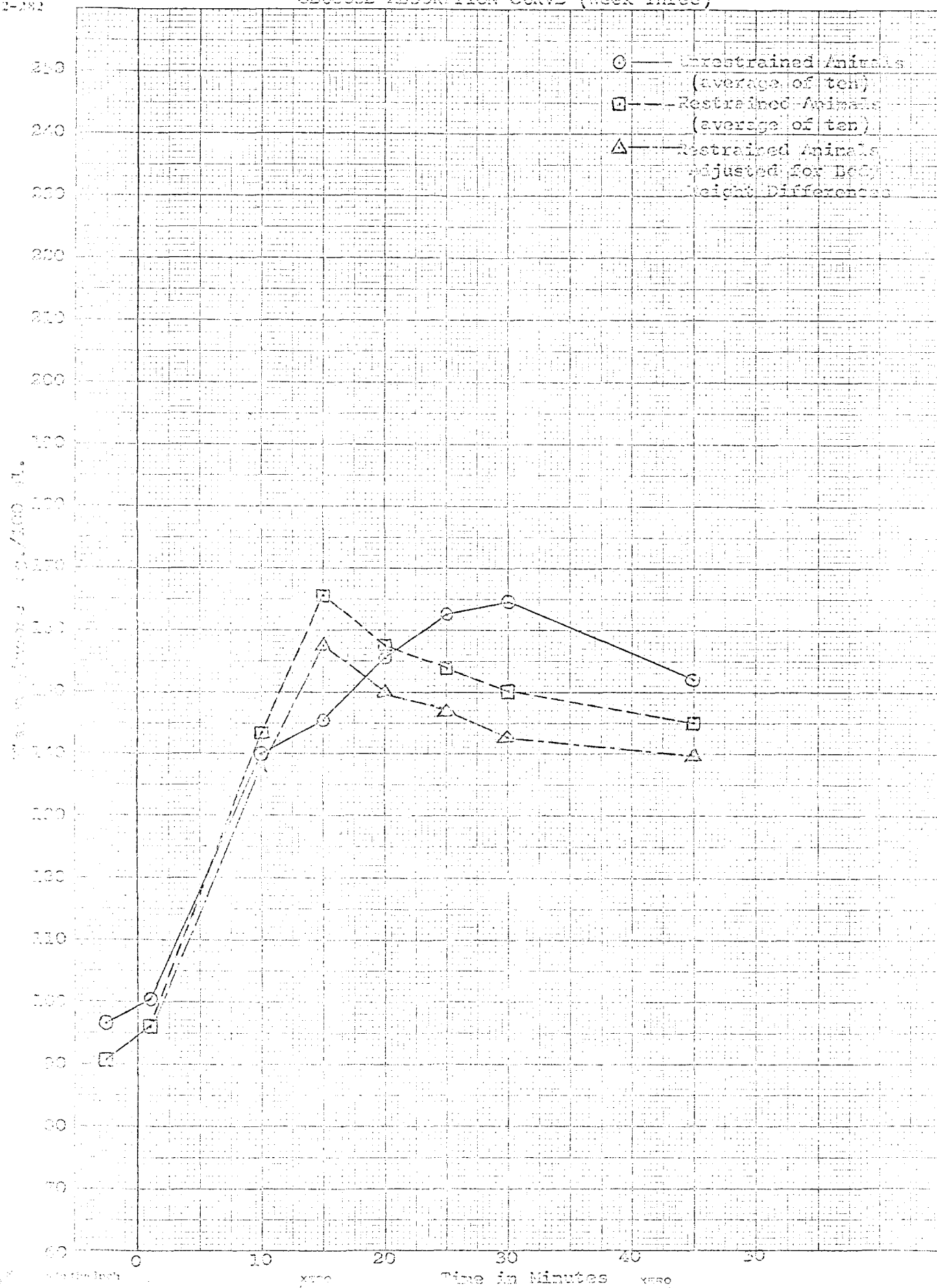


GLUCOSE ABSORPTION CURVE (Week Two)

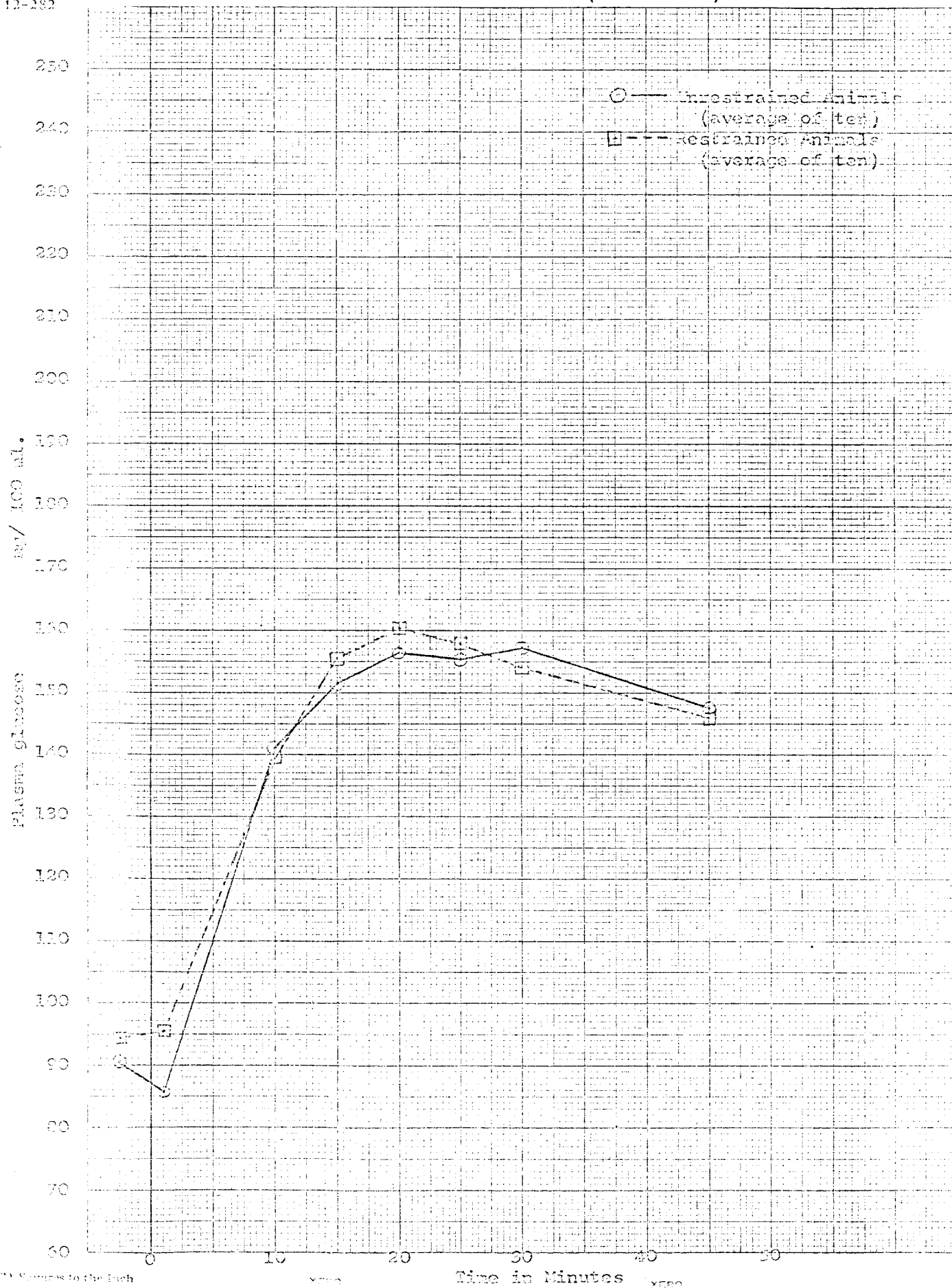


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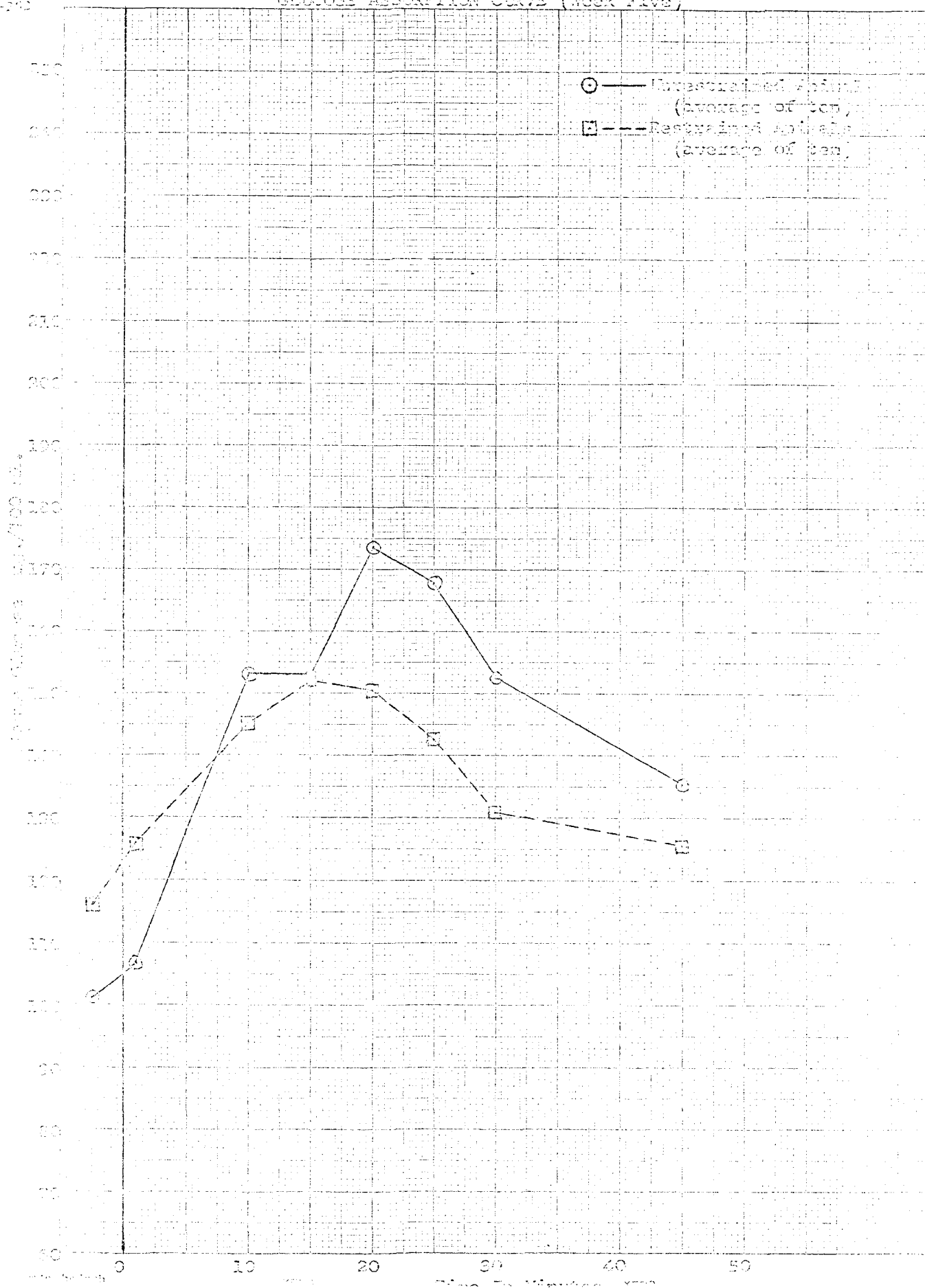
GLUCOSE ABSORPTION CURVE (Week Three)



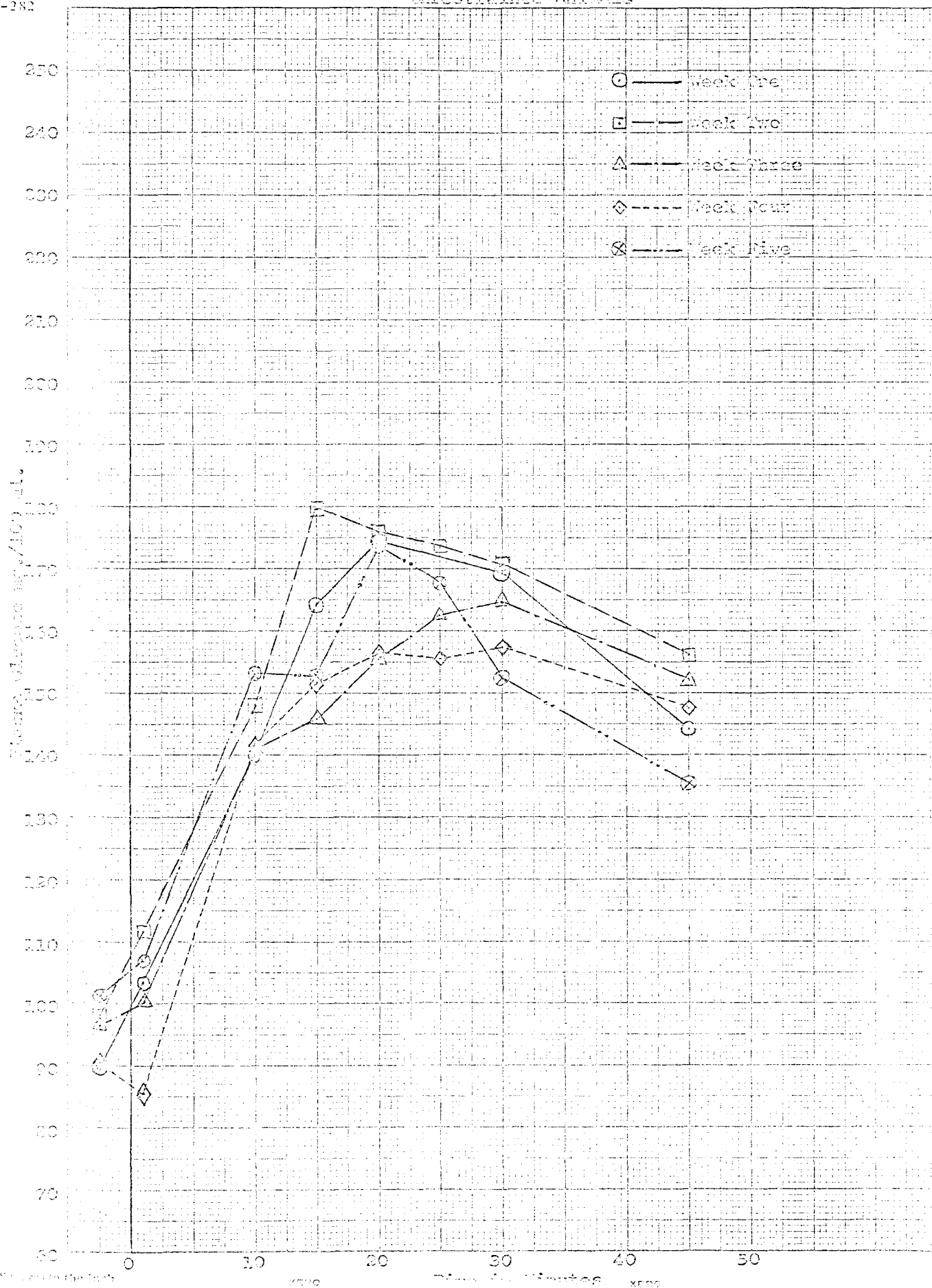
GLUCOSE ABSORPTION CURVE (Week Four)



GLUCOSE ABSORPTION CURVE (Week Five)

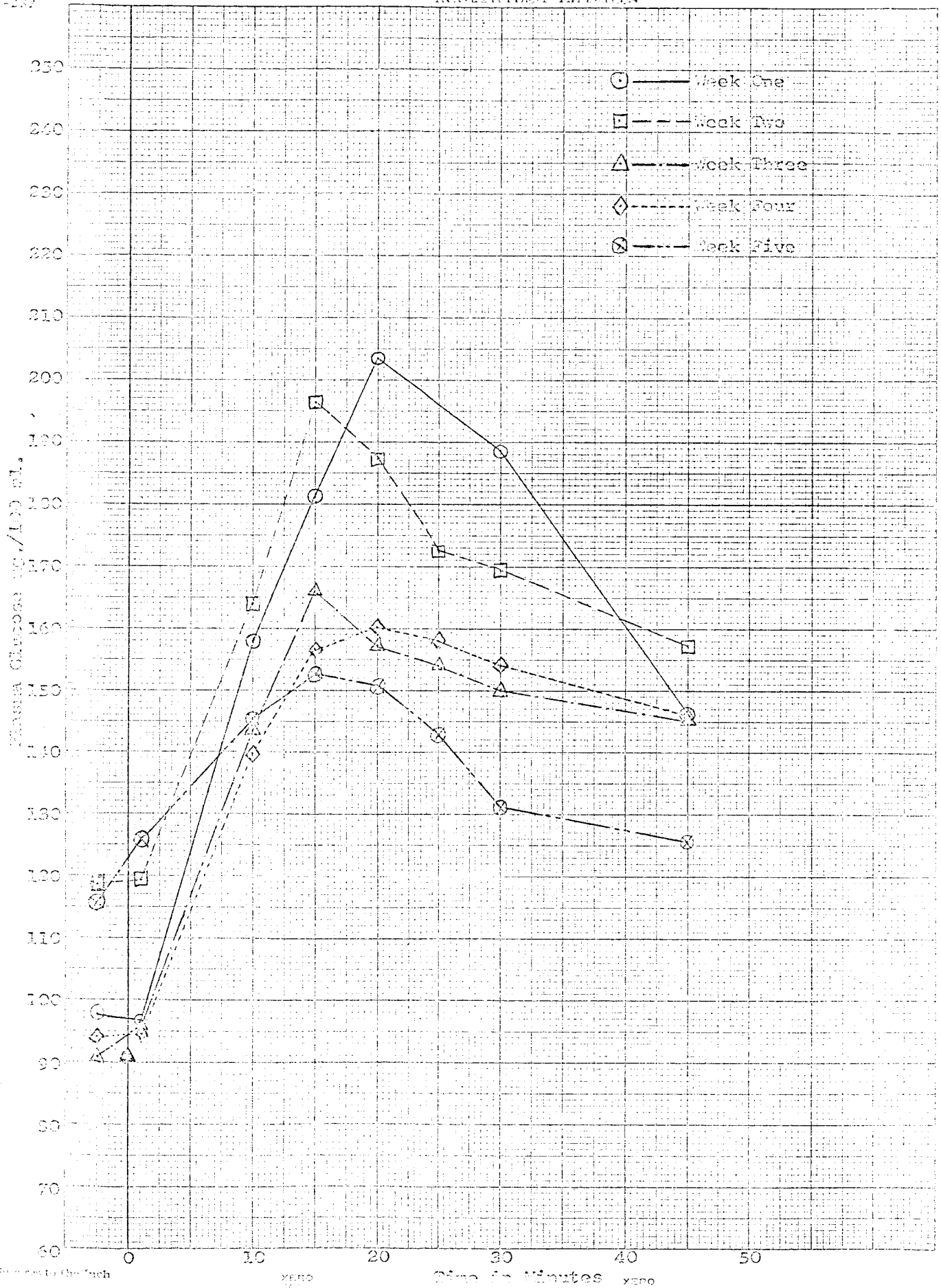


Glucose Absorption Curves (First Five Weeks, Unrestrained Animals)



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Glucose Absorption Curves (First Five Weeks, Restrained Animals



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| Hale, L. C. Ph.D. Carnegie Tech. 1958 | Part-time | Asst. Prof. E.E. |
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